

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
4 March 2004 (04.03.2004)

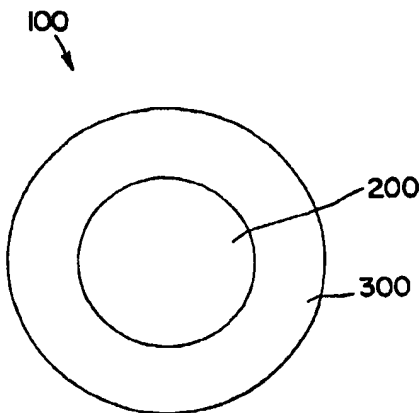
PCT

(10) International Publication Number
WO 2004/018746 A1

- (51) International Patent Classification⁷: **D01F 8/06**, (74) Agents: **JOHNSTON, Jason, W. et al.**; Dority & Manning, P.A., P.O. Box 1449, Greenville, SC 29602-1449 (US).
D04H 3/14
- (21) International Application Number: PCT/US2003/020138 (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 25 June 2003 (25.06.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 10/225,450 21 August 2002 (21.08.2002) US (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS; MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant: **KIMBERLY-CLARK WORLDWIDE, INC.** [US/US]; 401 N. Lake Street, Neenah, WI 54956 (US).
- (72) Inventors: **FORBES, Brian**; 10545 Virginia Pine Lane, Alpharetta, GA 30022 (US). **MAJORS, Mark**; 810 Spring Valley Drive, Cumming, GA 30041 (US). **SAYOVITZ, John**; 4687 Trinity Court, Marietta, GA 30068 (US).
- Published:
— with international search report

[Continued on next page]

(54) Title: MULTI-COMPONENT FIBERS AND NON-WOVEN WEBS MADE THEREFROM



(57) Abstract: Bicomponent spunbond filaments and non-woven webs made from the filaments are disclosed. The spunbond filaments include a core polymer and a sheath polymer. Both the core polymer and the sheath polymer are made primarily from polypropylene polymers. For instance, the sheath polymer can be a randomized copolymer of polypropylene and ethylene. The ethylene can be present in the sheath polymer in an amount of less than about 2% by weight. The core polymer, on the other hand, can be a polypropylene polymer having a melting temperature than the sheath polymer.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

MULTI-COMPONENT FIBERS AND NON-WOVEN WEBS MADE THEREFROM**Background of the Invention**

Non-woven fabrics made from polymeric materials are used to make a variety of products, which desirably have particular levels of softness, strength, uniformity, liquid handling properties such as absorbency, and other physical properties. Such products include towels, industrial wipes, incontinence products, 5 infant care products such as baby diapers, absorbent feminine care products, and garments such as medical apparel. These products are often made with multiple layers of non-woven fabric to obtain the desired combination of properties.

In many applications, the nonwoven fabrics are created from spunbond filaments that are formed by melt spinning thermoplastic materials. Methods for 10 making spunbond non-woven fabrics are well known and disclosed, for instance, in U. S. Patent No. 4,692,618 to Dorschner, et al., U. S. Patent No. 4,340,563 to Appel, et al., and U. S. Patent No. 5,418,045 to Pike, et al., which are all incorporated herein by reference. Spunbond non-woven polymeric webs are formed by extruding thermoplastic materials through a spinneret and drawing the 15 extruded material into filaments with a stream of high velocity air to form a random web on a collecting surface.

In some applications, in order to produce spunbond materials with desirable combinations of softness, strength and absorbency, spunbond non-woven fabrics are formed from multi-component filaments, such as bicomponent filaments. 20 Bicomponent filaments are filaments made from first and second polymeric components which remain distinct within the filament. For example, in one embodiment, the filament can be in a sheath and core arrangement in which a first polymeric component makes up the core and the second polymeric component makes up the sheath.

25 In the past, very useful bicomponent spunbond filaments have been made that contained a core polymer made from polyethylene and a sheath polymer made from polypropylene. The sheath polymer generally had a lower melting temperature than the core polymer to allow the filaments to be easily thermally

bonded together. The sheath polymer also provided softness to the resulting non-woven web. The core polymer, on the other hand, provided strength to the web.

Although the above-described spunbond filaments and non-woven webs made from the filaments have provided great advances in the art, further
5 improvements are still needed. In particular, a need exists for a less expensive alternative to the above-described spunbond filament that has substantially equal or better properties than spunbond filaments made in the past.

Summary of the Invention

In general, the present invention is directed to spunbond multi-component
10 filaments and to non-woven webs made from the filaments. For instance, in one embodiment, the present invention is directed to a non-woven web containing continuous polymeric multi-component filaments. The polymeric filaments include a sheath polymer and a core polymer. The sheath polymer comprises a copolymer of a polypropylene polymer and a monomer. The core polymer, on the
15 other hand, comprises a polypropylene polymer. In general, the core polymer has a melting temperature that is at least about 8°C (15°F) greater than the melting temperature of the sheath polymer. When combined to form a non-woven web, the filaments can be thermally fused together.

The sheath polymer can be present in the continuous filament in an amount
20 from about 20% by weight to about 70% by weight, and particularly from about 40% by weight to about 60% by weight. In one embodiment, the sheath polymer can comprise a randomized copolymer of the polypropylene and the monomer. The monomer can be, for instance, ethylene.

For example, in one embodiment of the present invention, the sheath
25 polymer is a randomized copolymer of polypropylene and ethylene. The ethylene is present in the sheath polymer in an amount of less than about 2% by weight and particularly less than about 1.8% by weight. It has been discovered by the present inventors that various benefits and advantages are achieved if the amount of ethylene present in the sheath polymer is below about 2% by weight.

30 The core polymer, on the other hand, can be about 98% by weight polypropylene. For example, in one embodiment, the core polymer can be a metallocene catalyzed polypropylene.

The melt flow rating of the sheath polymer and the core polymer can be from about 30 g/10 minutes to about 40 g/10 minutes, and particularly from about 30 g/10 minutes to about 35 g/10 minutes. The sheath polymer can have a melting temperature of from about 110 °C to about 150°C. As stated above, the
5 core polymer can have a melting temperature that is at least about 8°C greater than the melting temperature of the sheath polymer. Although various articles can be made in accordance with the present invention, the teachings of the present invention are particularly well-suited for the formation of spunbond fibers, and particularly spunbond continuous filaments.

10 Other features and aspects of the present invention are discussed in greater detail below.

Brief Description of the Drawings

A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth more
15 particularly in the remainder of the specification, which makes reference to the appended figures in which:

Figure 1 is a cross-sectional view of one embodiment of a bi-component filament made in accordance with the present invention; and

Figure 2 is a schematic drawing of one embodiment of a process line that
20 can be used to make filaments in accordance with the present invention.

Repeated use of reference characters in the present specification and drawings is intended to represent the same or analogous or elements of the invention.

Detailed Description

25 It is to be understood by one of ordinary skill in the art that the present discussion is a description of exemplary embodiments only, and is not intended as limiting the broader aspects of the present invention, which broader aspects are embodied in the exemplary constructions.

In general, the present invention is directed to non-woven webs made from
30 multi-component polymeric filaments. The non-woven webs are made so as to have a desired balance of physical properties. In general, the multi-component polymeric filaments are continuous bicomponent filaments that contain a core polymer surrounded by a sheath polymer. In accordance with the present

invention, both the core polymer and the sheath polymer contain primarily polypropylene. For instance, the sheath polymer can be a randomized copolymer of polypropylene, while the core polymer can be a crystalline polypropylene polymer having a relatively high melting point.

5 The present inventors have discovered that when using selected polypropylene polymers to construct the bicomponent filaments, non-woven webs can be formed that have improved strength and tear properties in comparison to non-woven webs made from monocomponent filaments, while also remaining soft and absorbent. Of particular advantage, non-woven webs with improved
10 properties can be formed according to the present invention using relatively inexpensive polypropylene materials, as opposed to resorting to the use of more expensive exotic polymers to enhance bonding or tenacity.

Referring to Figure 1, one embodiment of a cross-section of a filament generally 100 made in accordance with the present invention is shown. As
15 illustrated, the filament 100 is a bicomponent filament including a core polymer 200 surrounded by a sheath polymer 300. As described above, in accordance with the present invention, the core polymer 200 and the sheath polymer 300 are both made primarily from polypropylene polymers. Further, in one embodiment, the filament 100 is a spunbond filament that can be continuous.

20 As shown, the copolymer 200 and the sheath polymer 300 are arranged in distinctive zones across the cross section of the filament 100. Both polymers extend the entire distance of the filament 100. In this embodiment, the core polymer 200 is shown substantially concentric with the sheath polymer 300. It should be understood, however, that the core polymer and the sheath polymer can
25 be placed in various other arrangements. For instance, the core polymer 200 and the sheath polymer 300 can be placed in an eccentric arrangement as well.

In general, the sheath polymer 300 has a lower melting temperature than the core polymer 200. In this manner, the sheath polymer 300 of one filament can easily melt and fuse with the sheath polymer of an adjacent filament during the
30 formation of non-woven webs. Bonding can occur between adjacent filaments without melting the core polymer 200, which provides the filament with increased strength.

The sheath polymer 300 used to make filaments and non-woven webs in accordance with the present invention primarily contains a polypropylene polymer, such as a crystalline polypropylene. The polypropylene polymer should have a relatively low melt temperature, such as a melt temperature of less than about 5 150°C. Specifically, the melt temperature of the polypropylene sheath polymer can be from about 110°C to about 150°C and more particularly from about 120°C to about 135°C. The melt flow rating of the polymer can be from about 30 g/10 minutes to about 40 g/10 minutes, and particularly from about 30 g/10 minutes to about 35 g/10 minutes. The above-described melt flow ranges are particularly 10 well-suited for the formation of spunbond filaments in melt spinning operations.

In one embodiment, the sheath polymer is a copolymer of a polypropylene and a monomer, particularly a randomized copolymer of a polypropylene and a monomer. The monomer can be, for instance, ethylene or butene. The amount of monomer contained within the randomized polypropylene copolymer should be 15 relatively low in some applications. Specifically, it has been discovered by the present inventors that the monomer should be present within the randomized copolymer in an amount of less than about 2% by weight, particularly less than about 1.8% by weight. For example, in one embodiment, the monomer can be ethylene and can be contained in the randomized copolymer in an amount of less 20 than about 1.6% by weight.

Lower levels of monomer contained within the randomized copolymer provide various benefits and advantages of the present invention. For instance, when the monomer is present in an amount greater than about 2% by weight, it has been noticed that the filaments lose some strength and softness. Further, 25 the filaments tend not to quench effectively during formation. It is believed that better bonding characteristics between the copolymer and the sheath polymer are achieved when the monomer is present in an amount less than about 2% by weight.

In one embodiment of the present invention, the sheath polymer can be a 30 randomized copolymer of polypropylene and ethylene sold by Dow Chemical under the product number 6D43. Dow Chemical 6D43 polymer, however, contains ethylene in an amount of about 3.2% by weight. Thus, when used in the present

invention, greater amounts of polypropylene or another suitable polymer can be added to the product in order to reduce the monomer levels.

In general, the sheath polymer should contain polypropylene in an amount of about 95% by weight. Besides polypropylene, the sheath polymer can contain a
5 monomer as described above and other additional additives. Such additives can include antioxidants, heat stabilizers, other stabilizers, and the like.

The sheath polymer not only provides softness to spunbond filaments and non-woven webs made in accordance with the present invention, but also improves the toughness of the webs. For instance, due to its lower melting
10 temperature, the sheath polymer has a softer feel. Further, also because the sheath polymer has a lower melting temperature, the sheath polymer is well adapted to melting and fusing with adjacent fibers. In fact, since the sheath polymer can easily melt with other filament fibers during bonding, non-woven webs formed in accordance with the present invention have greater integrity and
15 toughness.

As described above, the core polymer 200 as shown in Figure 1 also contains primarily polypropylene. In comparison to the sheath polymer, however, the core polymer generally has a higher melting temperature than the sheath polymer. For instance, the core polymer can have a melting temperature that is at
20 least about 8°C (15°F) higher than the melting temperature of the sheath polymer, and particularly can have a melting temperature from about 8°C higher to about 15°C higher than the sheath polymer. For instance, the core polymer can have a melting temperature of greater than about 150°C, and particularly greater than about 155°C.

25 During thermal bonding of filaments made in accordance with the present invention, the core polymer generally does not significantly melt or degrade. The core polymer is present in the filament in order to increase the strength of the filament and to increase the strength of non-woven webs made from the filaments.

In one embodiment, the core polymer contains a homopolymer of
30 polypropylene in an amount of at least about 95% by weight. Other polymers and additives can be combined with the core polymer in relatively small amounts. In order to facilitate the formation of spunbond filaments, particularly continuous filaments in a melt spinning operation, the core polymer can have a melt flow rating

of from about 30 g/10 minutes to about 40 g/10 minutes, and particularly from about 33 g/10 minutes to about 39 g/10 minutes.

The polypropylene contained in the core polymer can be a Ziegler-Natta catalyzed polymer or, alternatively, can be a metallocene catalyzed polymer.

- 5 Metallocene catalyzed polymers provide various advantages including offering the possibility of providing a polymer with a relatively low molecular weight distribution. In one embodiment, the core polymer is product number 3155 or 3854 marketed by the Exxon Corporation.

- 10 In general, the sheath polymer is present in the filament in an amount from about 20% to about 70% by weight and particularly in amount from about 40% to about 60% by weight.

- 15 The teachings of the present invention are particularly well-suited to producing continuous melt spun filaments, such as spunbond filaments. Referring to Figure 2, a process line generally 10 for preparing spunbond filaments in accordance with the present invention is illustrated. The process line 10 is arranged to produce bicomponent continuous filaments and to produce non-woven webs made from the spunbond filaments. In this embodiment, the process line 10 includes a pair of extruders 12A and 12B for separately extruding a sheath polymer and a core polymer. The sheath polymer is fed into the extruder 12A from a first hopper 14A and the core polymer is fed into the extruder 12B from a second hopper 14B.

- 20 The sheath polymer and the core polymer are fed from the extruders 12A and 12B through polymer conduit 16A and 16B to a spinneret 18. Generally described, in one embodiment, the spinneret 18 includes a housing containing a spin pack which includes a plurality of plates stacked one on top of the other with a pattern of openings arranged to create flow paths for directing polymer components through the spinneret. The spinneret 18 has openings arranged in one or more rows. The spinneret openings form a downwardly extending curtain of filaments when the polymers are extruded through the spinneret.

- 30 In the embodiment illustrated, the process line 10 also includes a quench blower 20 positioned adjacent the curtain of filaments extending from the spinneret 18. Air from the quench air blower 20 quenches the filaments extending from the

spinneret 18. The quencher can be directed from one side of the filament curtain as shown in Figure 2, or both sides of the filament curtain.

The process line can further include a fiber draw unit or aspirator 22 positioned below the spinneret that receives the quenched filaments. Fiber draw units or aspirators for use in melt spinning polymers are well known as discussed above.

Generally described, the fiber draw unit 22 includes an elongate vertical passage through which the filaments are drawn by aspirating air entering from the sides of the passage and flowing downwardly through the passage. A heater 24 can supply hot aspirating air to the fiber drawn unit 22. The hot aspirating air draws the filaments and ambient air through the fiber draw unit.

An foraminous forming surface 26 is positioned below the fiber draw unit 22 and receives the continuous filaments from the outlet opening of the fiber draw unit. The forming surface 26 travels around guide roll 28. A vacuum 30 positioned below the forming surface 26 where the filaments are deposited draws the filaments against the forming surface.

In the embodiment illustrated in Figure 2, the process line 10 further includes a compression roller 32 which, along with the forward most of the guide rollers 28, receives the web as the web is drawn off of the forming surface 26. From the compression roller 32, the web is fed to a winding roll 42 for taking up the finished fabric. Prior to winding the web onto the roll 42, the process line can further include some type of bonding apparatus such as thermal point bonding rollers and/or a through-air bonder. Thermal point bonders and through-air bonders are well known to those skilled in the art and are not disclosed here in detail.

To operate the process line 10, the hoppers 14A and 14B are filled with the respective polymer components. The core polymer and the sheath polymer are melted and extruded by the respective extruders 12A and 12B through polymer conduit 16A and 16B and the spinneret 18. During extrusion, the polymers are heated to temperatures sufficient for the polymers to be flowable.

As the extruded filaments extend below the spinneret 18, a stream of air from the quench blower 20 at least partially quenches the filaments. The quench air, for instance, can flow in a direction substantially perpendicular to the length of

the filaments. The temperature of the quench air can be from about 45°F to about 90°F and can be at a velocity of from about 100 to 400 feet per minute.

After quenching, the filaments are drawn into the vertical passage of the fiber draw unit 22 by a flow of hot air from the heater 24 through the fiber draw unit.

5 It should be understood, however, that the use of a fiber draw unit is optional. When present in the system, the fiber draw unit can be used, for instance, to cause the filaments to slightly crimp. After exiting the fiber draw unit 22, the filaments are deposited onto the traveling forming surface 26. The vacuum 20 draws the
10 filaments against the forming surface to form an unbonded, non-woven web of continuous filaments. The web is then lightly compressed by the compression roller 32. Next, the web can be bonded together using any suitable technique, such as by using thermal point bonded rollers or by using a through-air bonder. When using a through-air bonder, air having a temperature above the melting
15 polymer is directed from a hood and through the web. The hot air melts the sheath polymer thereby forming bonds between the bicomponent filaments to integrate the web. The temperature of air flowing through the bonder can be from about 230°F to about 280°F and can be at a velocity of from about 100 to about 500 feet per minute.

20 Lastly, the finished web is wound into the winder roller 42 and is ready for further treatment or use. Spunbond non-woven webs constructed in accordance with the present invention have been found to offer various advantages and benefits. For instance, the non-woven webs have been found to have increased tensile strength and tear strength in relation to webs made only with a
25 polypropylene polymer. In fact, the webs have exhibited properties favorably comparable to conventionally made bicomponent filaments. Since the filaments of the present invention, however, are made almost exclusively of polypropylene polymers, the filaments are relatively inexpensive to produce.

Spunbond non-woven webs made in accordance with the present invention
30 can be used in numerous applications. For instance, the spunbond webs can be used for making personal care articles and garment materials. Personal care articles include infant care products such as disposable baby diapers, child care products such as training pants, and adult care products such as incontinence

products and feminine care products. Suitable garments include medical apparel, work ware and the like.

In one embodiment, spunbond non-woven webs made in accordance with the present invention can be combined with other webs for forming laminates. For example, the spunbond webs can be laminated to other spunbond webs or to meltblown webs. In one particular embodiment, for instance, a spunbond/melt blown/spunbond laminate is formed containing the non-woven webs of the present invention. The basis weight of the non-woven webs can be, for instance, from about 0.25 OSY to about 3 OSY, and particularly from about 0.50 OSY to about 2 OSY. In one embodiment, for instance, a spunbond/melt blown/spunbond laminate can be formed in which each layer has a basis weight of about 1 OSY.

These and other modifications and variations to the present invention may be practiced by those of ordinary skill in the art, without departing from the spirit and scope of the present invention, which is more particularly set forth in the appended claims. In addition, it should be understood that aspects of the various embodiments may be interchanged both in whole or in part. Furthermore, those of ordinary skill in the art will appreciate that the foregoing description is by way of example only, and is not intended to limit the invention so further described in such appended claims.

WHAT IS CLAIMED IS:

1. A non-woven web comprising continuous polymeric filaments, the polymeric filaments comprising multi-component filaments including a sheath polymer and a core polymer, the sheath polymer comprising a copolymer
5 polypropylene polymer and a monomer, the core polymer comprising a polypropylene polymer, the core polymer having a melting temperature that is at least about 15°F greater than the melting temperature of the sheath polymer, the continuous polymer filaments being fused together.
2. A non-woven web as defined in claim 1, wherein the sheath polymer
10 comprises a randomized copolymer.
3. A non-woven web as defined in claim 2, wherein the monomer comprises ethylene.
4. A non-woven web as defined in claim 2, wherein the monomer is present in the sheath polymer in an amount of less than about 2% by weight.
- 15 5. A non-woven web as defined in claim 3, wherein the monomer is present in the sheath polymer in an amount of less than about 2% by weight.
6. A non-woven web as defined in claim 1, wherein the continuous filaments comprise spunbond filaments.
7. A non-woven web as defined in claim 1, wherein the sheath polymer
20 and the core polymer have a melt flow rating of from about 30 g/10 minutes to about 35 g/10 minutes.
8. A non-woven web as defined in claim 1, wherein the sheath polymer has a melting temperature of from about 110°C to about 150°C.
9. A non-woven web as defined in claim 1, wherein the core polymer
25 comprises a metallocene catalyzed polypropylene.
10. A non-woven web as defined in claim 1, wherein the core polymer comprises polypropylene in an amount of at least 98% by weight.
11. A non-woven web as defined in claim 1, wherein the sheath polymer
30 comprises from about 20% by weight to about 70% by weight of the continuous filaments.
12. A non-woven web comprising polymeric fibers, the polymeric fibers comprising multi-component fibers including a sheath polymer and a core polymer, the sheath polymer comprising a random copolymer of a polypropylene polymer

and ethylene, the ethylene being present in the sheath polymer in an amount of less than about 2% by weight, the core polymer comprising a polypropylene polymer, the core polymer having a melting temperature that is at least about 15°F greater than the melting temperature of the sheath polymer, the polymeric fibers

5 being fused together.

13. A non-woven web as defined in claim 12, wherein ethylene is present in the sheath polymer in an amount of less than about 1.8% by weight.

14. A non-woven web as defined in claim 12, wherein the multi-component fibers are continuous filaments.

10 15. A non-woven web as defined in claim 12, wherein the multi-component fibers are spunbond fibers.

16. A non-woven web as defined in claim 12, wherein the sheath polymer and the core polymer have a melt flow rating of from about 30 g/10 minutes to about 35 g/10 minutes.

15 17. A non-woven web as defined in claim 12, wherein the sheath polymer has a melting temperature of from about 110°C to about 150° C.

18. A non-woven web as defined in claim 12, wherein the core polymer comprises a metallocene catalyzed polypropylene.

19. A non-woven web comprising continuous polymeric filaments, the
20 polymeric filaments having been formed by being extruded through a spinnerette, the polymeric filaments comprising multi-component filaments including a sheath polymer and a core polymer, the sheath polymer comprising a random copolymer of a polypropylene polymer ethylene, the ethylene being present in the sheath polymer in an amount of less than about 2% by weight, the core polymer
25 comprising a polypropylene polymer, the polypropylene being present in the core polymer in an amount of at least 95% by weight, the core polymer having a melting temperature that is at least about 15°F greater than the melting temperature of the sheath polymer, the core polymer and the sheath polymer having a melt flow rating of at least 30 g/10 minutes, the continuous polymeric filaments being fused
30 together to form the non-woven web.

20. A non-woven web as defined in claim 19, wherein the sheath polymer has a melting temperature of from about 110°C to about 150°C.

21. A non-woven web as defined in claim 19, wherein the core polymer comprises a metallocene catalyzed polypropylene.

22. A non-woven web as defined in claim 19, wherein the sheath polymer comprises from about 20% by weight to about 70% by weight of the
5 continuous filaments.

23. A non-woven web as defined in claim 19, wherein ethylene is present in the sheath polymer in an amount of less than about 1.8% by weight.

24. A fiber comprising:

A bicomponent spunbond filament including a sheath polymer and a
10 core polymer, the sheath polymer comprising a random copolymer of a polypropylene polymer and ethylene, the ethylene being present in the sheath polymer in an amount of less than about 2% by weight, the core polymer comprising a polypropylene polymer, the core polymer having a melting temperature that is at least about 15°F greater than the melting temperature of the
15 sheath polymer.

25. A fiber as defined in claim 24, wherein ethylene is present in the sheath polymer in an amount of less than about 1.8% by weight.

26. A fiber as defined in claim 24, wherein the sheath polymer and the core polymer have a melt flow rating of from about 30 g/10 minutes to about 35
20 g/10 minutes.

27. A fiber as defined in claim 24, wherein the sheath polymer has a melting temperature of from about 110°C to about 150° C.

28. A fiber as defined in claim 24, wherein the core polymer comprises a metallocene catalyzed polypropylene.

25 29. A fiber as defined in claim 24, wherein the sheath polymer comprises from about 20% by weight to about 70% by weight of the continuous filaments.

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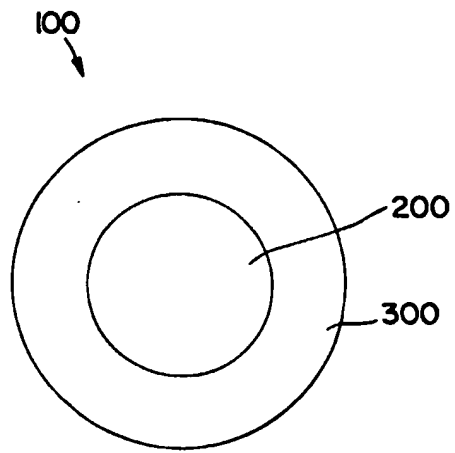


FIG. 1

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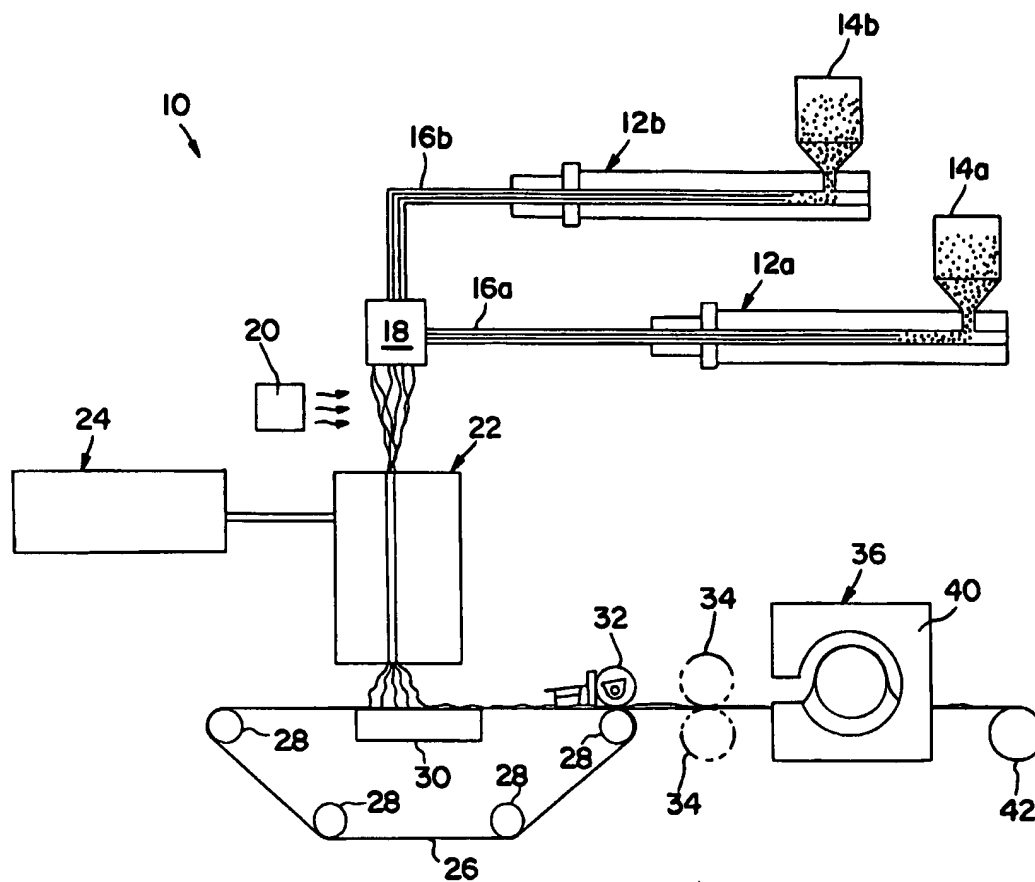


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No

PCT/US 03/20138

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 D01F8/06 D04H3/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D01F D04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 874 160 A (KECK LAURA ELIZABETH) 23 February 1999 (1999-02-23) example 2	1-3,6-8, 10,11
X	WO 98 29586 A (CHISSO CORP ; KOJIMA MITSURU (JP); SUZUKI MASAYASU (JP); KATAOKA YUKIN) 9 July 1998 (1998-07-09) the whole document	12,13, 16,17
A	WO 00 28123 A (KIMBERLY CLARK CO) 18 May 2000 (2000-05-18) the whole document	1-29

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Date of the actual completion of the international search

3 November 2003

Date of mailing of the international search report

13/11/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Tarrida Torrell, J

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/20138

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The particles are provided with a surface cross-linking in order to provide individual particle stability such that super absorbent gelling material has a measured SFC value of at least 30 units in accordance with the SFC test as defined herein, preferably more than 60 units.

The particles further have a substantially non-covalently bonded surface coating with a partially hydrolysable cationic polymer, such that said super absorbent gelling material has a measured ball burst strength (hereinafter referred to as BBS) of more than 80 grams of force after 30 minutes and a BBS after 16 hours of at least 50% of the BBS after 30 minutes in accordance with the BBS test as defined herein. Preferably the BBS is 100 to 130 grams of force after 30 minutes and BBS after 16 hours is in the range of 80%-120% of the BBS after 30 minutes. In order to fine-tune (stabilize or buffer) the cationic charge on the polymer it should be a hydrolysable polymer.

The covalent coating is present on the particles in an amount of less than 10% by weight of said particles, preferably between 0.05% and 5% and more preferably between 0.2% and 1% by weight. The partially hydrolysable cationic non-covalently bonded surface coating is preferably provided by an actually partially hydrolyzed cationic polymer, which preferably is hydrolyzed in the range of 40%-80%, more preferably in the range of 40%-60%, and most preferably in the range of 40%-50%. Excellent examples of such polymers are nitrogen containing polymer, which contains from 5 to 17 mol of cationic groups per kilogram of the nitrogen containing polymer. In a particular embodiment of the present invention is the coating is a partially hydrolyzed polymer of N-vinyl-alkyl-amide or N-vinyl-alkyl-imide, more preferably a polymer of N-vinyl-form-amide

Finally the super absorbent gelling material is present in the absorbent cores of the present invention in a concentration of 60% by weight or more, preferably in a concentration of 80% by weight or more, more preferably in a concentration of 96% by weight or more.

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After manufacturing of the SAP particles surface cross-linking can be used to obtain SAPs having relatively high PHL, PUP capacity and SFC values. Without being bound by theory, it is believed that surface cross-linking increases the resistance to deformation of SAP surfaces, thus reducing the degree of contact between neighboring polymer surfaces when the resultant hydrogel is deformed under an external pressure. Examples of such processes are disclosed in the references cited above.